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## PATENT ABSTRACTS OF JAPAN

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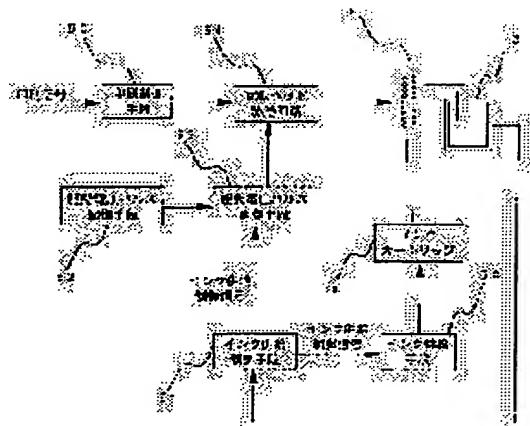
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## (54) INK JET TYPE RECORDING DEVICE

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To check the discharging characteristics of a recording head in charging irrespective of the reciprocatingly moving action between an ink cartridge and a sub-tank so as to improve print quality.

**SOLUTION:** In respectively response to two ink feeding states that a first process for supplying ink from an ink cartridge 6 through a recording head 8 to a sub-tank 10 and a second process for back-flowing the ink from the sub-tank 10 through the recording head 8 to the ink cartridge 6, a driving voltage pulse adjusting means 53 adjusts a driving voltage pulse condition for feeding to the recording head 8 optimally.



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**CLAIMS**

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**[Claim(s)]**

[Claim 1] An ink jet type recording head and a subtank equipped with the ink feed hopper by which ink flows into two common ink rooms which are open for free passage on both sides of a pressure generating room, and the ink room of said the community of each from the exterior, respectively are carried in carriage. Moreover, the ink cartridge which is open for free passage with said ink jet type recording head via passage out of said carriage, In the ink jet type recording device which comes to prepare an ink supply means to feed the ink of said ink cartridge to said ink jet type recording head The 1st process which is made to pass said recording head and supplements said subtank with ink from said ink cartridge, The ink supply control means which performs switch control with the 2nd process which is made to go via said recording head from said subtank, and flows backwards ink to said ink cartridge to said ink supply means, The ink jet type recording device characterized by having a driver voltage pulse adjustment means to adjust the driver voltage pulse supplied to said recording head based on the ink supply control signal from this ink supply control means.

[Claim 2] It is the ink jet type recording device according to claim 1 which said subtank possesses an ink residue detection means to detect the ink residue in a subtank, and is characterized by said driver voltage pulse adjustment means adjusting the driver voltage pulse supplied to said recording head corresponding to the ink supply control signal from the ink residue detected from this ink residue detection means, and said ink supply control means.

[Claim 3] Said subtank equips at least a part with a flexible film, and said ink residue detection means equips the location used as ink full with the piece of a corresponding movement following expansion of said flexible film. It is based on data. the time check from after counting of the number of pulse signals which makes the ink droplet from after said 1st process termination breathe out while detecting ink full by detection of migration of said piece of a corresponding movement, and said 1st process termination — The ink jet type recording device according to claim 2 characterized by detecting the ink residue condition in a subtank.

[Claim 4] It is the ink jet type recording device which sets they to be [ any / claim 1 thru/or / of 3 ], possesses a temperature detection means to detect surrounding ambient temperature further, and is characterized by said driver voltage pulse adjustment means adjusting further the driver voltage pulse supplied to said recording head according to the ambient temperature detected with said temperature detection means.

[Claim 5] Said driver voltage pulse adjustment means is an ink jet type recording device according to claim 1 to 4 characterized by adjusting said driver voltage pulse so that the amount of ink of the unit ink droplet in said 1st process and said 2nd process which carries out the regurgitation from said recording head may serve as abbreviation regularity.

[Claim 6] Said driver voltage pulse adjustment means is an ink jet type recording device according to claim 1 to 4 characterized by adjusting said driver voltage pulse so that the ink droplet rate of the ink droplet in said 1st process and said 2nd process which carries out the regurgitation from said recording head may serve as abbreviation regularity.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]**

**[0001]**

**[Field of the Invention]** This invention relates to the ink jet type recording device which prints by supplying ink to a subtank and a recording head through passage from the ink cartridge which carried the ink jet type recording head and the subtank in carriage, and was installed in the box.

**[0002]**

**[Description of the Prior Art]** An ink jet type recording apparatus carrying in carriage the ink jet type recording head which carries out the regurgitation of the ink droplet with a pressure generating means, and it printing, receiving supply of ink from an ink cartridge, also carrying an ink cartridge in the carriage usually equipped with the recording head, and attaining simplification of structure is performed.

**[0003]** In order for dot density to become large by leaps and bounds with improvement in the engine performance of an ink jet type recording head, to, attain color printing with natural color on the other hand and to aim at improvement in much more printing quality, efforts to make the blot on a record medium small as much as possible are made.

**[0004]** Ink is made to contain an emulsion and sugar as the one means, and approaches, such as carrying out film formation of the ink droplet on a record medium, are proposed.

**[0005]** If it is in ink equipped with such film formation nature, since a possibility of barring the flow of the ink to a recording head by the porous body which is inevitably needed for the cartridge of an on-cartridge type is high, while a subtank is carried in carriage, the separation ink supply system which pumps up ink from the ink cartridge \*\*\*\*(ed) by the box, and supplies ink to a recording head through this subtank is proposed.

**[0006]** For example, while carrying a recording head and a subtank in carriage so that JP,4-43785,B may see, after connecting a subtank and the Main tank by the tube and pumping up new ink on a subtank, it is constituted so that ink may be supplied to a recording head from a subtank.

**[0007]** According to this, there is a merit which can lightweight-ize weight of the whole carriage and it not only can supply ink to a recording head directly, but can aim at high-speed printing and extension of the period of an ink supplement. However, it has the problem that the air bubbles generated within the subtank with the reciprocating motion of carriage on the other hand invade into a recording head, and check the regurgitation of ink.

**[0008]** In order to solve such a problem, connecting a recording head, a subtank, and an ink cartridge to endless, and circulating ink is also proposed. However, since two passage of the passage for outward trips and the passage for return trips is needed between a recording head and an ink cartridge, it has the problem that passage structure becomes complicated.

**[0009]** In order to solve such a problem, these people etc. The ink jet type recording head and subtank which equipped two common ink rooms which are open for free passage on both sides of a pressure generating room, and the ink room of each community with the ink feed hopper which connects with the exterior, respectively are carried in carriage. Moreover, out of carriage, an ink cartridge and an ink supply means to feed the ink of an ink cartridge intermittently to a recording head are established. The ink jet type recording device it was made to make as ink reciprocated

between an ink cartridge and a subtank by making a recording head into a relay point is proposed.

[0010]

[Problem(s) to be Solved by the Invention] According to this, thickening of the ink in the film formation and the subtank in a recording head can be prevented as much as possible, without causing complication of structure. however, \*\* [ in / on the time of a switch with the 1st process which is made to pass a recording head and supplements a subtank with ink from an ink cartridge in order to make, as ink reciprocates between an ink cartridge and a subtank by making a recording head into a relay point, and the 2nd process which is made to go via a recording head from a subtank, and flows backwards ink to an ink cartridge, and / the pressure generating room of a recording head ] — a static pressure will be changed frequently. For this reason, the regurgitation property of the ink droplet rate and the amount of ink droplets of an ink droplet which carry out the regurgitation from a recording head was changed frequently, and it is concentration nonuniformity or had the trouble that deterioration of the printing quality on a record medium called a color difference gap occurred, in color printing.

[0011]

[Means for Solving the Problem] In order to cancel such a trouble, it sets to this invention. An ink jet type recording head and a subtank equipped with the ink feed hopper by which ink flows into two common ink rooms which are open for free passage on both sides of a pressure generating room, and the ink room of said the community of each from the exterior, respectively are carried in carriage. Moreover, the ink cartridge which is open for free passage with said ink jet type recording head via passage out of said carriage, In the ink jet type recording device which comes to prepare an ink supply means to feed the ink of said ink cartridge to said ink jet type recording head The 1st process which is made to pass said recording head and supplements said subtank with ink from said ink cartridge, The ink supply control means which performs switch control with the 2nd process which is made to go via said recording head from said subtank, and flows backwards ink to said ink cartridge to said ink supply means, It had a driver voltage pulse adjustment means to adjust the driver voltage pulse supplied to said recording head based on the ink supply control signal from this ink supply control means.

[0012]

[Function] By adjusting the driver voltage pulse supplied to a recording head corresponding to reciprocation actuation of ink, automatic amendment of the frequent pressure fluctuation of the pressure generating room caused by the actuation which makes ink reciprocate between an ink cartridge and a subtank is carried out, and the effect by said pressure fluctuation of the regurgitation property of a recording head is suppressed.

[0013]

[Embodiment of the Invention] Then, based on the example illustrating the detail of this invention, it explains below.

[0014] (The 1st example) Drawing 1 thru/or drawing 10 explain the 1st example of this invention.

[0015] Drawing 1 shows one example of the ink jet type recording apparatus by this invention, and the sign 1 in drawing is carriage, and it is constituted so that both-way migration may be carried out in parallel with the revolving shaft 5 of a platen 4 which it is supported by the guide members 2 and 3 and is mentioned later. The recording head 8 which carries out direct continuation to the ink cartridge 6 prepared in the box with the ink tube 7, and the subtank 10 which connects with a recording head 8 with a tube 9, and collects ink are carried in carriage 1. Moreover, the \*\* ink tank 17 which holds a capping means to close in contact with a recording head 8, and the ink discharged from the recording head 8 is formed in the non-printing area.

[0016] It is the above-mentioned platen, 4 holds the record form taken out from the paper tray 11 with the pickup roller 12 on a front face by the claw part material 13, and it is constituted, drying ink at the built-in heater so that the delivery opening 14 may be made to discharge, while catching the ink droplet from a recording head 8 in a record form and making a dot form.

[0017] 6 is the above-mentioned ink cartridge, and an ink supply needle is inserted by the lever 15 operational [ from ] outside a box 18, and it can supply ink now to a recording head 8 through

the ink tube 7 which is the passage linked to this needle. In addition, the sign 19 in drawing shows a ventilating fan.

[0018] Drawing 2 , drawing 3 , drawing 4 , and drawing 5 show one example of the ink jet type recording head 8 mentioned above, respectively, it is a nozzle plate, and two or more nozzle orifices 21 are drilled, and the sign 20 in drawing serves as a member which closes one field of the spacer 22 mentioned later. Septa 23 and 23 and 23 .. are formed at equal intervals, 22 forms nozzle orifices 21 and 21, the pressure generating rooms 24 and 24 which are open for free passage to 21 .., and 24 .. so that the nozzle orifices 21 and 21 and 21 .... which are a spacer and adjoin may be separated, it is a nozzle plate about one field, and the closure of the field of another side is carried out with the diaphragm 25.

[0019] It is prepared so that the pressure generating rooms 24 and 24 and the common ink rooms 26 and 27 of 24 .... as shown in both sides at drawing 2 and drawing 3 may be open for free passage in the pressure generating room 24, and the common ink of another side can be moved now via the pressure generating rooms 24 and 24 and 24 .. from one common ink room 26.

[0020] Moreover, as shown in drawing 5 , the 1st ink feed hopper 30 connected to an ink cartridge 6 through the ink tube 7 and the 2nd ink feed hopper 31 linked to the subtank 10 are formed in the common ink rooms 26 and 27.

[0021] It returns to drawing 2 again, and the sign 28 in drawing is a piezoelectric device, the laminating of an electrode and the piezo-electric oscillating ingredient is carried out on sandwiches, it is constituted so that vibration with longitudinal-oscillation mode may be generated, the same number and its tip are contacted [ .... / nozzle orifices 21 and 21 and / 21 ] with a diaphragm 25, and the other end is being fixed to the pedestal 29. It elongates by the driver voltage pulse based on a printing signal, and a piezoelectric device 28 makes an ink droplet breathe out from a nozzle orifice 21.

[0022] Drawing 6 shows the outline of the ink supply system of the ink jet type recording apparatus mentioned above, and the subtank 10 carried in the ink bag 41 with which the 1st ink feed hopper 30 of the recording head 8 carried in carriage 1 is held in the ink cartridge 6 with the ink tube 7 the same again at carriage 1 is connected to the 2nd ink feed hopper 31 of a recording head 8.

[0023] The ink bag 41 is compressed by ink supply means to pressurize the airtight space 44 of a cartridge 6 with air from an air pump 42 by such configuration at this example where a nozzle orifice 21 is closed with a capping means etc., and ink flows into the 1st feed hopper 30 of a recording head 8 via the ink tube 7.

[0024] Ink passes through the pressure generating room 24 from one common ink room 26, and flows into the common ink room 27 of another side. The ink which flowed into the common ink room 27 passes the 2nd ink feed hopper 31, and flows into the subtank 10.

[0025] The air bubbles which remain in the common ink rooms 26 and 27 or the pressure generating room 24 in this process, and the ink in which concentration became high by about 21 nozzle orifice again are discharged by the subtank 10, and a nozzle orifice 21 and the pressure generating room 24 are washed in the new ink from an ink cartridge 6.

[0026] If a supplement of ink on the subtank 10 progresses and the pressure of the space of the subtank 10 rises, only air will be emitted to atmospheric air from the bulb 47 for air-bleeders. If the subtank 10 is filled up with the ink of the specified quantity, a signal will output from the ink full sensor 45 mentioned later, and an air pump 42 will stop, and the bulb 47 for air-bleeders will also be closed.

[0027] Then, the ink of the subtank 10 flows into a recording head 8 according to the water head difference based on the difference of elevation of carriage 1 and a cartridge 6, and flows backwards to an ink cartridge 6 further.

[0028] If the back flow to an ink cartridge 6 progresses and the amount of ink of the subtank 10 decreases, a signal will output from the ink empty sensor 46 mentioned later. An air pump 42 operates by this, ink is fed from an ink cartridge 6, and the same process as the above-mentioned is repeated.

[0029] Thus, while both-way circulation with the subtank 10 and ink cartridge 6 which went via

the recording head 8 is repeated and new ink washes the pressure generating room 24, the common ink rooms 26 and 27, and nozzle orifice 21 of a recording head 8, the viscosity of ink is maintained to a uniform value.

[0030] Drawing 7 shows one example of the subtank of the above-mentioned ink jet type recording apparatus, and it is a base, and the sign 60 in drawing forms in one the 3rd rib 63 prolonged in the production top of the closure section 65 which welds opening of the bag body 70 mentioned later, a rib 61, a rib 62, the 2nd ink feed hopper 31 of a recording head 8, and the end connection 64 open for free passage with injection molding of polymeric materials etc., and is constituted.

[0031] Furthermore, the above-mentioned bulb 47 for air-bleeders is arranged above this closure section 65, and through-hole 63a which an end punctures to an end connection 64, and the other end punctures at a tip is drilled by the 3rd rib 63.

[0032] With the bag body, 70 bends a \*\* type-like high polymer film with a center line, welds three-side 70a other than upside opening, and 70b and 70c, and is formed. And the closure section 65 was inserted in opening formed in other one side of a bag body 70, and it has fixed to the base 60 so that it may weld around the closure section 65 and airtightness may be secured.

[0033] In this example, if ink is fed from an ink cartridge 6, ink will be extruded by the bag body 70 through an end connection 64. If the bag body 70 expands with the inflow of ink and it fills up with the ink of the amount of conventions, the piece of a corresponding movement which is not illustrated will move outside greatly following the swelling of a bag body 70, the signal of ink full will output from the ink full sensor 45, and liquid sending of ink will be stopped.

[0034] Then, according to the water head difference based on the difference of elevation of carriage 1 and a cartridge 6, the ink in a bag body 70 flows into a recording head 8 from the lower limit of through-hole 63b currently formed in the 3rd rib 63, and flows backwards to an ink cartridge 6 further. If a back flow advances and the ink in a bag body 70 approaches the amount of ink empty conventions, it will fade in the shape of [ which makes the upper part a base in accordance with the configuration of ribs 61, 62, and 63 ] a triangle. The ink empty sensor 46 which consisted of quantity of light detectors detects the passage quantity of light which increases rapidly because the lower field of a bag body 70 sticks as ink empty, and outputs a signal. An air pump 42 operates by this, ink is fed from an ink cartridge 6, and the same process as the above-mentioned is repeated.

[0035] Drawing 8 is the block diagram showing one example of this invention. In this example, the wave of the driver voltage pulse supplied to a recording head 8 between an ink cartridge 6 and the subtank 10 corresponding to the actuation which makes ink reciprocate is made adjustable. The configuration for adjusting a driver voltage pulse according to the block diagram of drawing 8 is explained.

[0036] The sign 50 in drawing is an ink supply means, and based on the ink supply control signal from the ink supply control means 51 mentioned later, it pressurizes the airtight space 44 of a cartridge 6 with air from an air pump 42, and it is constituted so that ink may be supplied to a recording head 8 and the subtank 10.

[0037] 51 is the above-mentioned ink supply control means, and outputs an ink supply control signal to the ink supply means 50 corresponding to the condition of the amount of ink in the subtank 10 detected from the ink full sensor 45 and the ink empty sensor 46. It is constituted so that an ink supply control signal may be outputted also to a driver voltage pulse adjustment means 53 to mention later to it and coincidence.

[0038] The 1st process which 52 is a driver voltage pulse storage means, and supplements the subtank 10 with ink via a recording head 8 from an ink cartridge 6 with the ink supply means 50, As opposed to two ink supply conditions of the 2nd process which is made to go via a recording head 8 from the subtank 10, and flows backwards ink to an ink cartridge 6 The data which specify the optimal driver voltage pulse conditions which are needed for obtaining the optimal printing result, and which are investigated beforehand and determined are stored, and it is constituted.

[0039] 53 is the above-mentioned driver voltage pulse adjustment means, and based on the ink supply control signal inputted from the ink supply control means 51, it reads the optimal driver



voltage pulse conditions from the driver voltage pulse storage means 52, and it sets up this driver voltage pulse condition so that it may become the output of the recording head drive circuit 54.

[0040] In addition, the sign 55 in drawing shows the printing control means which controls the recording head drive circuit 54 based on the printing signal from an external device.

[0041] Next, it does in this way and the regurgitation property of the ink droplet of the constituted equipment is explained using drawing 9 and drawing 10. Drawing 9 is the diagram showing the relation between the ink residue of a subtank, and the ink droplet weight of a regurgitation ink droplet. Drawing 10 is the diagram showing the wave of the driver voltage pulse impressed to a recording head.

[0042] First, as shown in (a) in drawing 10, when a driver voltage pulse is set constant regardless of the ink round trip actuation between an ink cartridge 6 and the subtank 10, the relation between the ink residue of the subtank 10 and the ink droplet weight of a regurgitation ink droplet comes to be shown in drawing 9 (a). In the 1st process which is feeding ink on the subtank, supply of ink is smoothly made by the pressurization from an air pump 42 at the pressure generating room 24 from an ink cartridge 6. If the amount of ink of the subtank 10 reaches the ink full set point, from the ink full sensor 45, a signal will output, an air pump 42 will be stopped and ink feeding will stop. The pressure which takes for the pressure generating room 24 at this time declines by the pressure by ink feeding, the regurgitation property of a recording head 8 changes and ink droplet weight falls. The remainder flows backwards to an ink cartridge 6 according to the water head difference based on [ in the 2nd process which ink feeding has stopped, as for the ink in the subtank 10, a part is breathed out as an ink droplet from a recording head 8, and also ] the difference of elevation of carriage 1 and an ink cartridge 6. The ink serviceability from the subtank 10 declines as the amount of ink in the subtank 10 approaches the ink empty set point, and ink droplet weight falls further. If the amount of ink in the subtank 10 reaches the ink empty set point at last, from the ink empty sensor 46, a signal will output, an air pump 42 will be operated and ink feeding will begin. It goes up by the pressure by ink feeding, the regurgitation property of a recording head 8 changes, and ink droplet weight increases the pressure which takes for the pressure generating room 24 at this time. Thus, if ink round trip actuation between an ink cartridge 6 and the subtank 10 is performed, the ink droplet weight difference in the 1st process and the 2nd process will occur.

[0043] As [ in (b) in drawing 10, and the 2nd process ] shown in (c) in drawing 10, when driver voltage is made adjustable at the 1st process corresponding to the ink round trip actuation between an ink cartridge 6 and the subtank 10, the relation between the ink residue of the subtank 10 and the ink droplet weight of a regurgitation ink droplet comes to be shown in drawing 9 (b). Then, in this invention, at the 1st process out of which ink droplet weight tends to come, the driver voltage pulse adjustment means 53 sets driver voltage as (b) lower than (a) in drawing 10, and sets driver voltage as (c) higher than (a) in drawing 10 by the 2nd process out of which ink droplet weight cannot come easily conversely. Thereby, it does not depend on the ink round trip actuation between an ink cartridge 6 and the subtank 10, but the ink droplet weight difference in the 1st process and the 2nd process becomes small.

[0044] In this example, by making driver voltage adjustable to the recording head drive circuit 54, the driver voltage pulse adjustment means 53 adjusted so that the amount of ink of the unit ink droplet in the 1st process and the 2nd process might serve as abbreviation regularity. even making pulse duration of a driver voltage pulse adjustable to the recording head drive circuit 54 apart from this — the amount of ink of the unit ink droplet in the 1st process and the 2nd process — abbreviation — adjusting so that it may become fixed is possible — carrying out — a pulse — the ink droplet rate of the regurgitation ink droplet in the 1st process and the 2nd process — abbreviation — adjusting so that it may become fixed is also possible.

[0045] (The 2nd example) The 2nd example is proportionate to said configuration, and drawing 11 is the block diagram showing the 2nd example of this invention. The point that the 2nd example differs from the 1st example is a point that detect the ink residue in the subtank 10 with the ink residue detection means 80, and the driver voltage pulse adjustment means 53 sets up a driver voltage pulse corresponding to two parameters called the ink supply control signal from this ink

residue value and the ink supply control means 51.

[0046] 80 is an ink residue detection means and detects the ink residue in the subtank 10. the pulse signal later mentioned after the ink residue detection means 80 of this example detects ink full by the ink full sensor 45 in the 2nd process which is made to go via a recording head 8 from the subtank 10, and flows backwards ink to an ink cartridge 6 — counting — based on counting of the number of pulse signals which makes the ink droplet from a means 81 breathe out, the amount of ink consumed by the regurgitation of an ink droplet is computed by the operation. moreover, the time check which mentions the ink residue detection means 80 later — the amount of ink which carried out the natural back flow to the ink cartridge 6 is computed from the subtank 10 after detecting ink full based on the time amount which has passed after detecting the ink full clocked by the means 82. The ink residue of the subtank 10 is calculated as a value which subtracted the amount of ink which flowed backwards to the amount of ink consumed by the regurgitation of an ink droplet from the ink residue of ink full known beforehand, and the ink cartridge 6.

[0047] On the contrary, it sets at the 1st process which supplements the subtank 10 with ink via a recording head 8 from an ink cartridge 6 with the ink supply means 50. The amount of feeding ink per unit time amount from the ink cartridge 6 currently investigated beforehand to the subtank 10, the time check mentioned later — based on the time amount which has passed after starting ink feeding clocked by the means 82, the total amount of ink fed to a recording head 8 and the subtank 10 after starting ink feeding is calculated. The ink residue of the subtank 10 is calculated by the ink residue detection means 80 as a value which subtracted the amount of ink consumed by the regurgitation of an ink droplet from the sum of this fed total amount of ink, and the ink residue of the subtank 10 at the time of initiation of ink feeding.

[0048] The ink residue detection means 80 of this example has the description that an ink residue is correctly detectable with a simple configuration, compared with the method which detects an ink residue mechanically or electrically. Moreover, as compared with the 1st example, even if there is no ink empty sensor 46 of the subtank 10, it has the description that ink empty is detectable.

[0049] 81 — a pulse signal — counting — it is a means, and the number of pulse signals which makes an ink droplet breathe out to the signal from the printing control means 55 is counted, and this counting is passed to the ink residue detection means 80.

[0050] Are a means and it is based on a signal from the ink supply control means 51. 82 — a time check — whenever [ which changes an ink supply control signal ] — a former time check — the time amount which has passed after resetting data and starting ink feeding — or \*\*\*\*\* of time amount which has passed after detecting the ink full of the subtank 10 is clocked, and it is constituted so that the timer means formed in the body of a recording apparatus and the time-of-day data inputted from host equipment again may be acquired and wearing duration may be calculated.

[0051] In this example, to two parameters called two ink supply conditions of the 1st process and the 2nd process which become clear with an ink supply control signal, and the ink residue in the subtank 10, the driver voltage pulse storage means 52 is investigated beforehand, stores the data which specify the optimal driver voltage pulse conditions determined, and is constituted.

[0052] Based on the ink residue in the subtank 10 inputted from the ink supply control signal and the ink residue detection means 80 which were inputted from the ink supply control means 51, the driver voltage pulse adjustment means 53 reads the optimal driver voltage pulse conditions from the driver voltage pulse storage means 52, and it sets up this driver voltage pulse condition so that it may become the output of the recording head drive circuit 54.

[0053] Since the effect not only an ink supply condition but the ink residue in the subtank 10 affects the regurgitation property of a recording head 8 can be amended as compared with the 1st example according to this example as stated above, the ink residue in the subtank 10 is not caused how, but it has the effectiveness that a uniform regurgitation property is acquired.

[0054] (The 3rd example) In this example, it differs in that input the detection data of surrounding ambient temperature into the driver voltage pulse adjustment means 53, consider the temperature dependence of ink viscosity to the 1st above-mentioned example or the 2nd

above-mentioned example, and a driver voltage pulse is adjusted further.

[0055] Drawing 12 is the block diagram showing this example applied to the 1st example. The temperature data measured with the temperature sensor 90 which is a temperature detection means are incorporated by the driver voltage pulse adjustment means 53 through A-D converter 91.

[0056] With the driver voltage pulse adjustment means 53, based on the temperature data inputted as the ink supply control signal from the ink supply control means 51 from the temperature sensor 90, the driver voltage pulse conditions which are beforehand investigated by the driver voltage pulse adjustment means 52, and are memorized are said to read-out, and the driver voltage pulse conditions of having taken into consideration the ambient temperature around a recording device in the recording head drive circuit 54 are set up.

[0057]

[Effect of the Invention] The 1st process which according to this invention is made to pass a recording head and supplements a subtank with ink from an ink cartridge as explained above, Two ink supply conditions of the 2nd process which is made to go via a recording head from a subtank, and flows backwards ink to an ink cartridge are embraced, respectively. Since the driver voltage pulse conditions which a driver voltage pulse adjustment means supplies to a recording head were adjusted to adjustable Automatic amendment of the effect of the expulsion-of-an-ink-droplet property on the frequent pressure fluctuation in the pressure generating room caused by the actuation which makes ink reciprocate between an ink cartridge and a subtank is carried out, and fluctuation of the regurgitation property of a recording head is suppressed. Consequently, it is concentration nonuniformity or the ink jet type recording device of an ink circuit system without deterioration of the printing quality on a record medium called a color difference gap can be realized in color printing.

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**DESCRIPTION OF DRAWINGS**

**[Brief Description of the Drawings]**

**[Drawing 1]** It is the block diagram showing one example of the ink jet type recording device of this invention.

**[Drawing 2]** It is drawing showing one example of the ink jet type recording head used for equipment same as the above with the structure of the cross section in a horizontal direction.

**[Drawing 3]** It is the front view in which removing a nozzle plate and showing one example of the ink jet type recording head used for equipment same as the above with relation with a nozzle orifice.

**[Drawing 4]** It is drawing showing one example of the ink jet type recording head used for equipment same as the above with the structure of the longitudinal section in the axis which passes along a nozzle orifice.

**[Drawing 5]** In the ink jet type recording head used for equipment same as the above, it is the top view showing one example of the spacer which forms a common ink room.

**[Drawing 6]** It is drawing showing the outline of the ink supply system of this invention.

**[Drawing 7]** It is drawing showing one example of the subtank of the ink jet type recording apparatus of this invention.

**[Drawing 8]** It is the block diagram showing the 1st example of this invention.

**[Drawing 9]** It is the diagram showing the relation between the ink residue of a subtank, and the ink droplet weight of a regurgitation ink droplet.

**[Drawing 10]** It is the diagram showing the wave of the driver voltage pulse impressed to a recording head.

**[Drawing 11]** It is the block diagram showing the 2nd example of this invention.

**[Drawing 12]** It is the block diagram showing the 3rd example of this invention.

**[Description of Notations]**

- 1 Carriage
- 6 Ink Cartridge
- 8 Recording Head
- 10 SubTank
- 45 Ink Full Sensor
- 50 Ink Supply Means
- 51 Ink Supply Control Means
- 52 Driver Voltage Pulse Storage Means
- 53 Driver Voltage Pulse Adjustment Means
- 54 Recording Head Drive Circuit
- 55 Printing Control Means
- 80 Ink Residue Detection Means
- 81 Pulse Signal — Counting — Means
- 82 Time Check — Means

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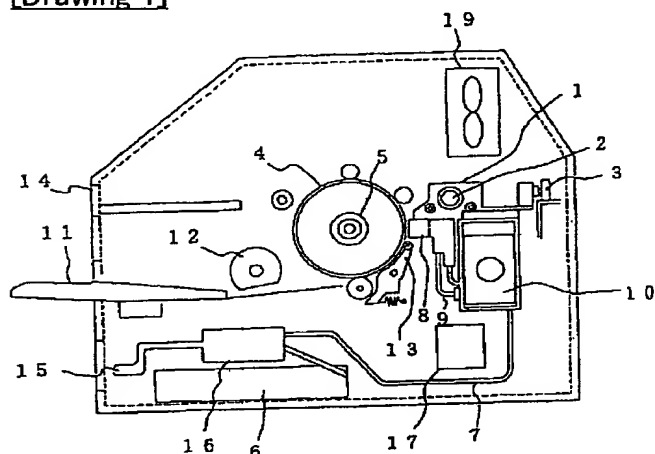
1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\* shows the word which can not be translated.

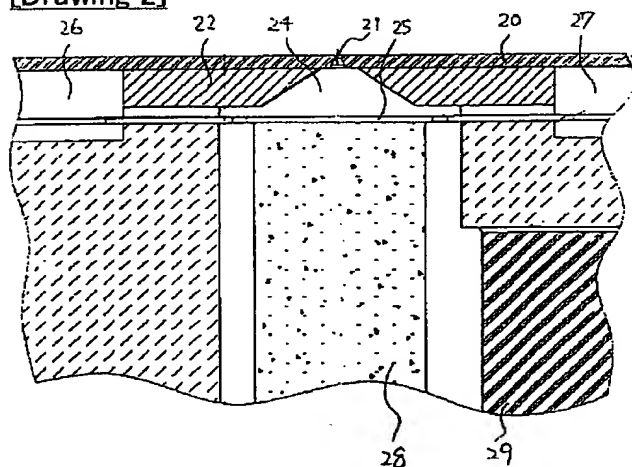
3.In the drawings, any words are not translated.

## DRAWINGS

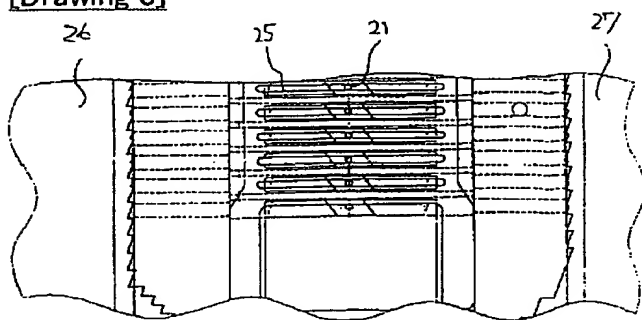
[Drawing 1]



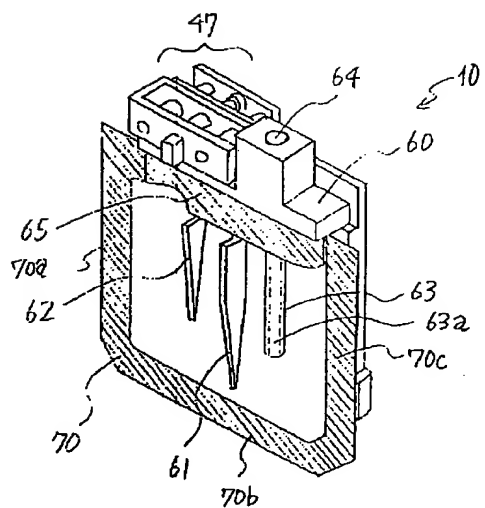
[Drawing 2]



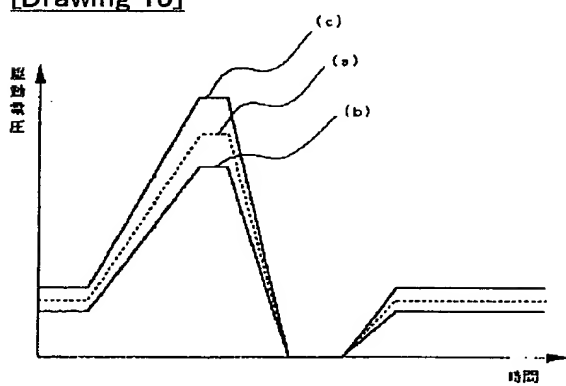
[Drawing 3]



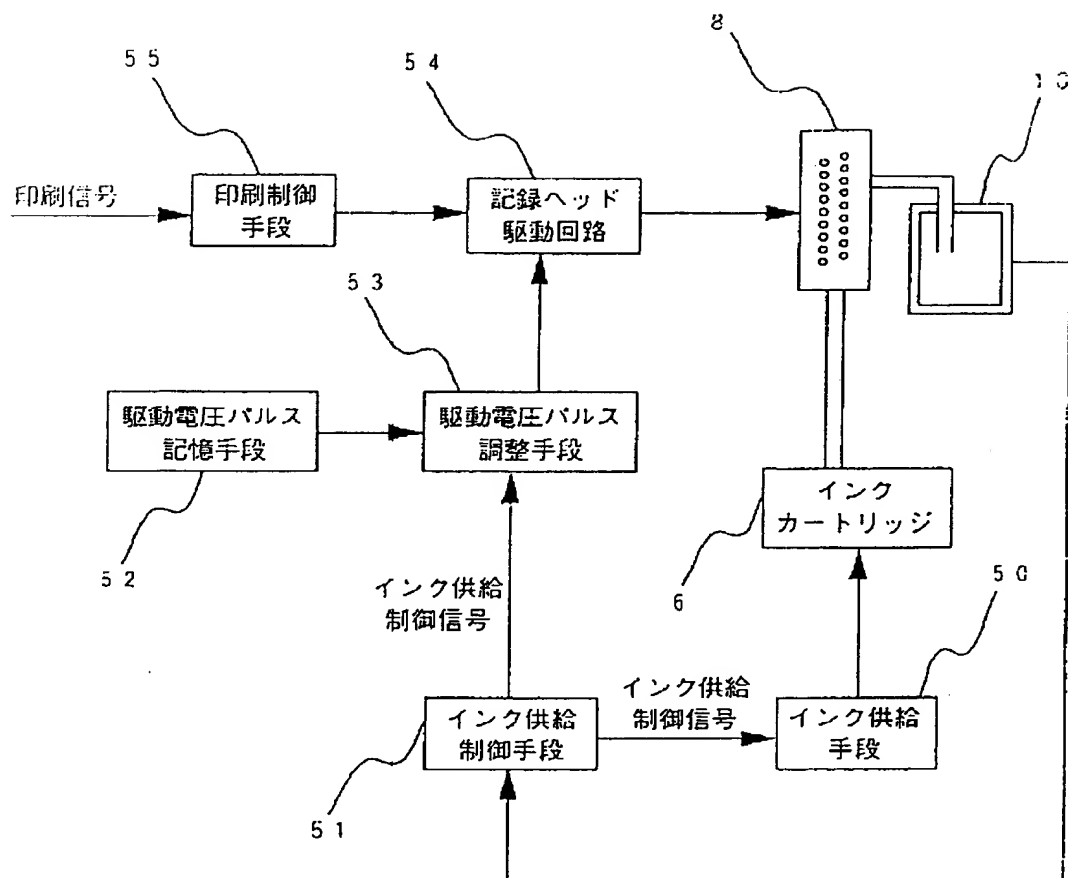




[Drawing 10]

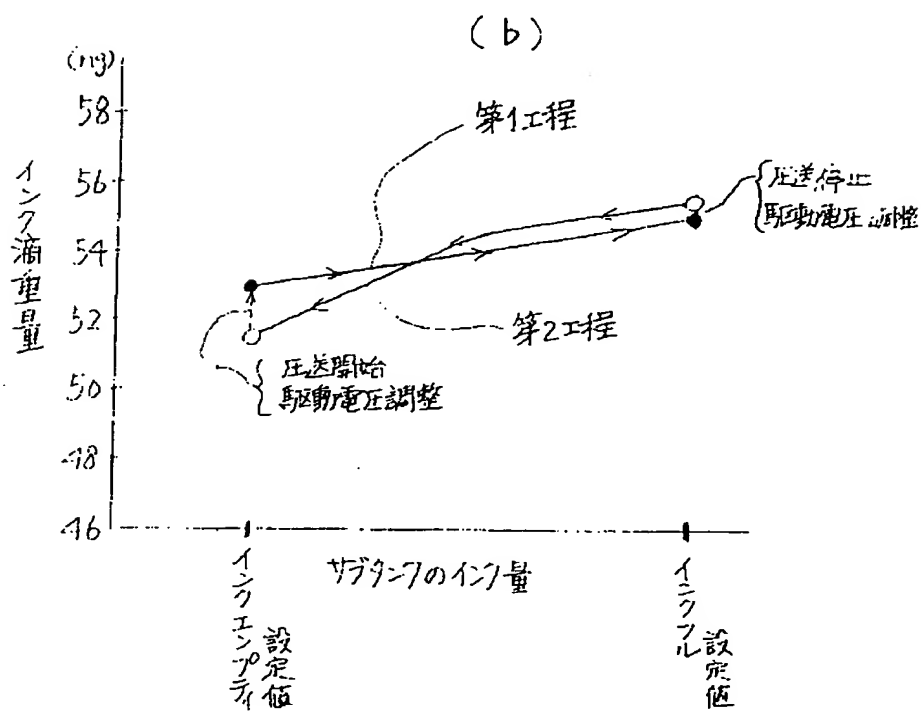
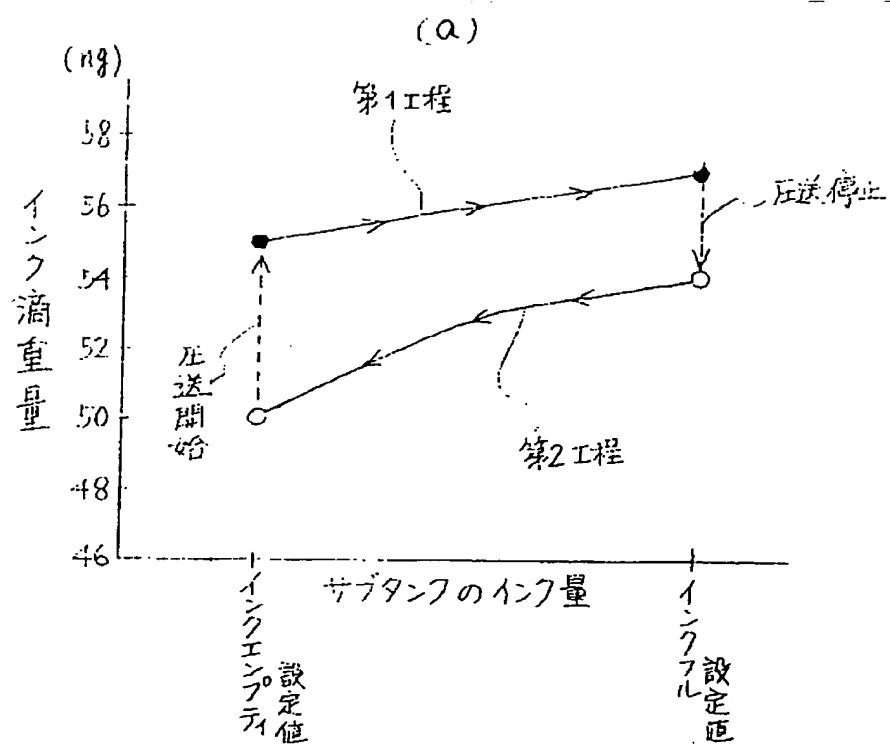


[Drawing 8]

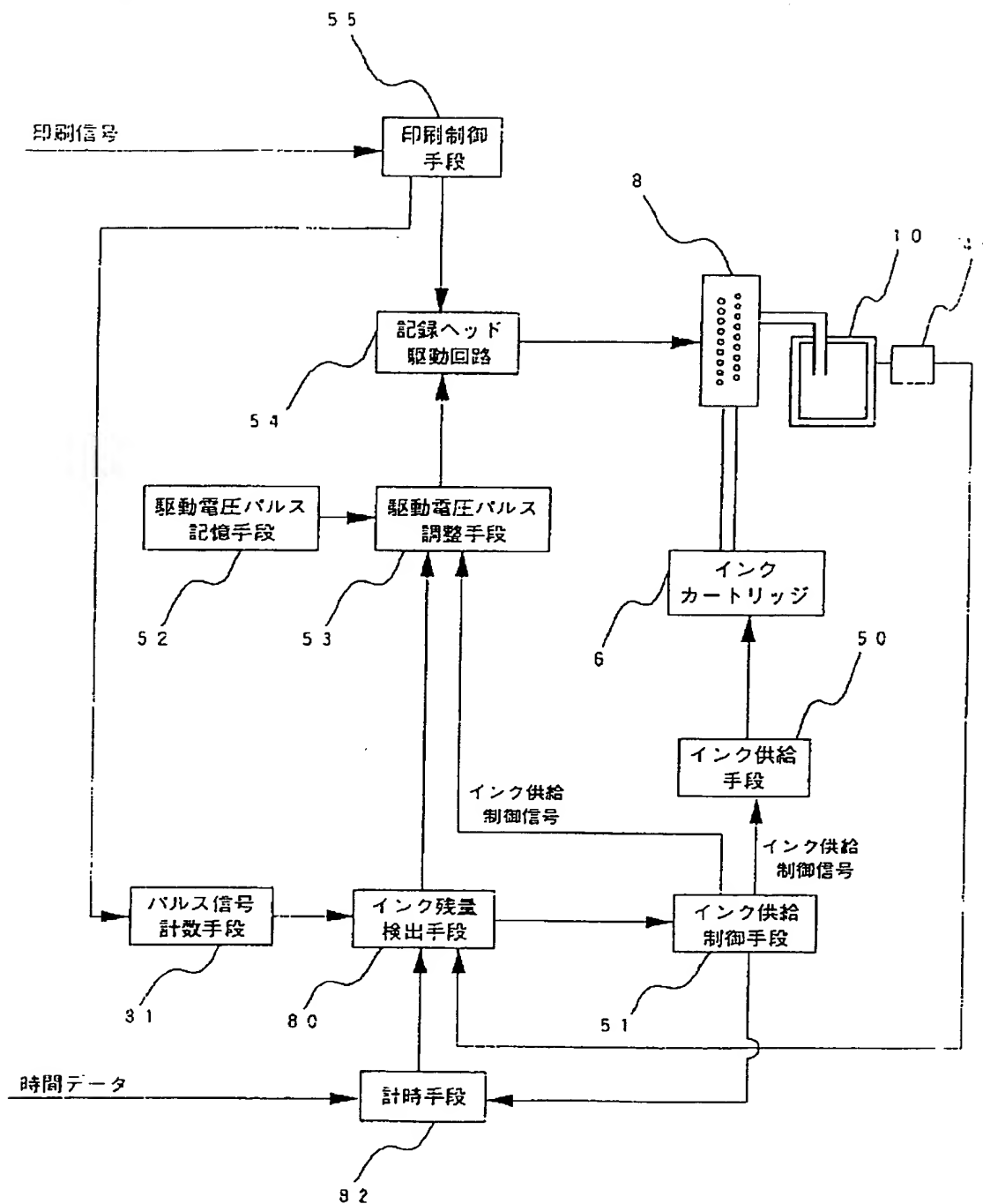


[Drawing 9]

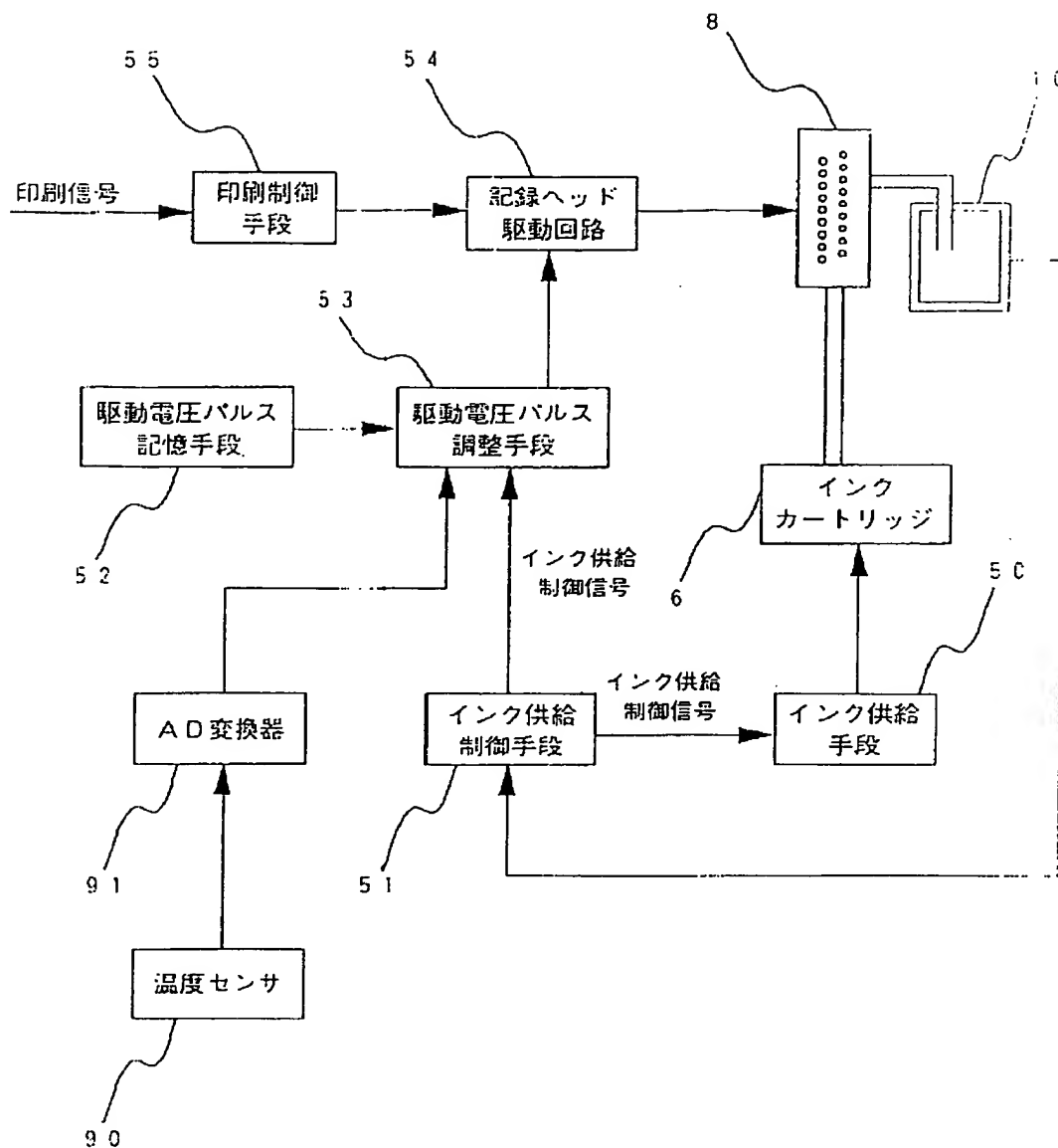




[Drawing 11]



[Drawing 12]



[Translation done.]

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